

Claims

- [c1] 1. A method for fabricating a transistor, comprising:
forming a semiconductor film over a substrate;
forming a semiconductor island by patterning the semiconductor film;
forming an insulating film over the substrate;
performing an optical annealing process to crystallize the semiconductor island; and
forming a transistor on the semiconductor island.
- [c2] 2. The method of claim 1, wherein a portion of the insulating film serves as a gate insulator of the transistor.
- [c3] 3. The method of claim 1, after the step of forming the insulating film comprising:
forming a semi-transparent film on the insulating film, wherein the semi-transparent film has an absorption coefficient of 4000 cm^{-1} – 20000 cm^{-1} with respect to a light beam.
- [c4] 4. The method of claim 1, wherein the step of forming the insulating film comprises:
forming a silicon oxide film; and
forming a semi-transparent film on the silicon oxide

film, wherein the semi-transparent film has an absorption coefficient of $4000\text{ cm}^{-1} - 20000\text{ cm}^{-1}$.

[c5] 5. The method of claim 1, wherein the step of forming the semiconductor island comprises:
forming an amorphous semiconductor film over the substrate;
illuminating the amorphous semiconductor film by a light beam through a mask, to convert a portion of the amorphous semiconductor film being illuminated into a crystallized semiconductor; and
performing a gas etching process, to remove a portion of the amorphous semiconductor without being crystallized.

[c6] 6. The method of claim 1, wherein the step of forming the semiconductor island comprises:
forming an amorphous semiconductor film over the substrate;
performing an light exposure process, wherein the amorphous semiconductor film is in an oxygen ambience and is illuminated by a light beam through a mask, so as to form an oxide film on the amorphous semiconductor film at a portion being exposed to the light beam; and
performing a gas etching process, to remove a portion of the amorphous semiconductor film not being covered by the oxide film.

- [c7] 7. The method of claim 6, wherein the step of performing the gas etching process comprises:
producing hydrogen atoms; and
etching the amorphous semiconductor film by the hydrogen atoms.
- [c8] 8. The method of claim 1, wherein at least the steps of from the step of forming the semiconductor film to the step of forming the insulating film are performed in chambers without being exposed to the air.
- [c9] 9. An equipment for fabricating a transistor, comprising at least one operation chamber in a close space for at least performing the steps of from the step of forming the semiconductor film to the step of forming the insulating film the steps in the method of claim 1, without being exposed to the air.
- [c10] 10. A patterning method on an amorphous semiconductor film, comprising:
preparing a mask with a pattern, allowing a light to pass;
illuminating a light beam through the mask onto the amorphous semiconductor film, so as to crystallize a portion of the amorphous semiconductor film into a crystal semiconductor portion; and
performing a gas etching process, to remove another

portion of the amorphous semiconductor film other than the crystal semiconductor portion.

[c11] 11. The method of claim 10, wherein the amorphous semiconductor film comprises amorphous silicon film or amorphous germanium film.

[c12] 12. The method of claim 10, wherein the gas etching process uses hydrogen atoms for etching.

[c13] 13. A patterning method on an amorphous semiconductor film, comprising:
preparing a mask with a pattern, allowing a light to pass;
disposing the amorphous semiconductor film in an oxygen ambience;
illuminating a light beam through the mask onto the amorphous semiconductor film, so as to form an oxide film on a portion of the amorphous semiconductor film;
and
performing a gas etching process, to remove another portion of the amorphous semiconductor film not being covered by the oxide film.

[c14] 14. The method of claim 13, wherein the amorphous semiconductor film comprises amorphous silicon film or amorphous germanium film.

[c15] 15. The method of claim 13, wherein the gas etching

process uses hydrogen atoms for etching.

- [c16] 16. A structure of thin-film transistor (TFT), comprising:
a poly-crystal semiconductor island, formed on a substrate, wherein the poly-crystal semiconductor island is with respect to a rectangular region having a long side and a short side, wherein a plurality long-shape crystal grains from a center strip region along the direction of the long side to the long side;
a gate insulating film, over the semiconductor island;
and
a strip gate, located on the gate insulating film between the center grain boundary and the long side, wherein a direction of the strip gate in along the direction of the long side; and
a source region and a drain region are parts of the semiconductor island at each side of the strip gate.
- [c17] 17. The structure of claim 16, wherein the number of the long crystal grains is determined by a ratio of the long side to the short side.
- [c18] 18. The structure of claim 16, wherein the semiconductor island has a saw-like periphery along the long sides.
- [c19] 19. The structure of claim 16, further comprising a strip semiconductor peninsula joining to one side of the

semiconductor island.

- [c20] 20. The structure of claim 16, wherein the center strip region is a center grain boundary.
- [c21] 21. The structure of claim 16, wherein the semiconductor island is used as an active island of the thin-film transistor without additional patterning.